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What are the key success factors behind the competitiveness of Silicon Valley IT cluster?

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Abstract

Nowadays many countries face a challenge of achieving competitive advantage over other nations. One factor affecting the rate of competitiveness of a nation is an ability to organize effective collaboration between such players as companies, research institutes, government and other actors inside the region. In other words, presence of a healthy and developed cluster in the region will accelerate its competitiveness.

When looking at the examples of various clusters Silicon Valley IT cluster is by far one of the most developed aggregation of interconnected actors. Therefore, the objective was to find out what were the factors that cause Silicon Valley IT cluster to be prosperous and competitive. The GAP model was used as the theoretical framework. The task was to identify the "gaps" between multiple members inside and outside the cluster: and to ind out what were the elements or "bridges" that were inherent in Silicon Valley's collaboration between cluster's stakeholders.

Results identified several factors affecting general competitiveness of Silicon Valley IT cluster. The first factor was high mobility of resources and information enhanced with the use of innovations that were being developed inside. The second factor was ambitious entrepreneurs who were keen on achieving their goal regardless of possible resource limitations. The third factor was failure tolerant environment which allowed enthusiastic individuals to get a fresh start in case of fiasco.

We can conclude that long-term efficient collaboration between cluster stakeholders together with mobility of resources result in the accelerated competitiveness.

Keywords/tags (subjects)

Silicon Valley IT cluster, competitiveness, cluster, GAP model

Miscellaneous (Confidential information)

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1 Introduction

In the modern world countries are competing in achieving economic growth. It can be done in many different ways therefore some countries are achieving better results than others when it comes to numbers. One factor that causes some countries being more economically developed is the ability to accumulate various companies, educational institutes and research centers within one industry. In other words, by providing all necessary conditions for cluster establishment. (Furman, Porter, & Stern 2002, 899.)

There is a general belief that countries with strong and developed clusters have higher potential in terms of economic growth and development. Clusters may emerge from any industry yet the Information Technology (IT) is among the most common ones. However, when talking about IT there are still countries which are much more ahead of others in terms of development as well as in terms of innovations coming from there. (ibid., 899-900.)

Although, there are multiple IT clusters all across the globe, Silicon Valley IT cluster is the most well-known one. According to Chen, Liu, & Trunina (2018) Silicon Valley IT cluster is the world's most dynamic and profound region in economic sense. It is located in the region of southern San Francisco Bay Area in northern part of California. It is a magnet for innovations and entrepreneurs from near-by areas as well as from other parts of the world. (3-4.)

It has the biggest density of industrial networks, knowledge intensity, community dynamics between companies, governments as well as other sectors. High skilled labor markets as well as constant supply of venture capital (VC) motivate entrepreneurship and experimentation. With the help of exceptional culture, professional networks and efficient industry leadership Silicon Valley is able to attract and retain talented and ambitious individuals. Daily business in Bay Area include exists of large scale as well as massive growth. (ibid., 4.)

Research motivation

What comes to the relevance for an industry, clusters are entrenched into historical, political and economic setting which affects norms and values which in their turn will have an impact on processes and actors of the cluster. Hence cluster members may achieve outstanding results by being in exchange relationship through their knowledge channels, resources ties. (Awuah, Abraha, & Osarenkhoe 2011.) Hesels and Parker (2013, 139) signify the fact that by being a part of collaborative network SMEs will be benefiting in internationalization processes since they will be granting a decision-makers with additional channels to information, with introduction to new partners.

Another factor that comes through clusters and has a relevance to an industry is innovations. There is a very small amount of innovations which are born in isolation and within separate sources. Dasanayaka and Sardana (2010, 60) see innovation as a complex, interactive and cumulative learning process which involves variety of actors in diverse ways. Since companies are not able to fit all skills and resources within itself. Instead they rely on collaboration with external parties and other organizations.

SMEs' major challenge is coming from a need to cooperate with large number of external parties which creates organizational and cultural problems. However, clusters can facilitate in the reduction of those difficulties by providing a common platform for companies. In the end the main relevance of this research to the industry is that accumulation of SMEs as well as other actors will result in the development of products that are manufactured hence will accelerate the development of the whole industry. Consequently, a location with strong industry is likely to benefit the growth and development of the whole region. (ibid., 62)

Speaking of the relevance to particular clusters above information states that Silicon Valley IT cluster through the years was able to grow from a region with a number of small companies operating in semiconductor sphere to the world's largest innovative center not to mention the most competitive area in the whole IT field. As it had already been mentioned there are various other IT clusters across the globe, however, none of them are able to have as great amount of innovations as in Silicon Valley.

In addition, other clusters are not able to attract such numbers of talented and high skilled individuals as well as big supporting organizations. In other words, the described above phenomenon states that none of the countries was able to duplicate Silicon Valley so far (Engel 2015, 36). Therefore, the main objective of this research is to find out and understand what are the features present in the Silicon Valley IT cluster which make it successfully competitive and cannot be implemented in any other country (Brown, & Duguid 2000).

Coming to the personal relevance it has to be noted that interest in this particular topic developed through out a long period of time. At the beginning of the studies one of the courses was dealing with economics of internationalization and competitiveness. In other words, it was exploring what competitiveness is in terms of various actors. Actors included, company, country, city and cluster. Every class was dedicated to one part and included the theoretical principles and practical cases of companies and regions. As time went on realization came that it was fairly easy to define competitiveness on a company and cluster levels yet city and nation included many details and were challenging when it came to the measure of competitiveness. The whole concept of cluster seemed to be unexplored and had many issues which were not understood. During the additional research a lot of valuable information was found about what clusters are, how they emerge and what are the actors involved. Moreover, when it came to the examples interest increased even more as all theoretical principals and concepts started to be visible in lives of various accumulations of companies. Coming directly to the Silicon Valley, it caught the attention with diverse news articles coming from many different places about huge companies and their insanely large profits. Moreover, one of the course related tasks included the statistics about the several aspects related to the ways of measuring competitiveness. Most of the numbers were coming from the SMEs and companies which turned out to be located in Silicon Valley or near-by it. Therefore, an idea came to research more about the place and what is it in there that makes it so special. As more and more information is gathered and processed about the topic the realization came that Silicon Valley is something that has never been replicated in any part of the world. Therefore, an idea came to firstly find out what is the history of the place and how it all evolved as well as to understand the possible features that caused such a

huge success and at the same time to find out what Silicon Valley has that no other nation does.

Research questions

Nowadays, it is difficult for an industry to grow and develop on its own. IT industry is not an exception. The business problem, companies from IT industry, and especially those who are cluster members are suffering is inability to communicate effectively as well as being able to build new connections and retain the already existing ones. According to Fjellström and Osarenkhoe (2017, 177), Portero, Hervás-Oliver and Puig (2012) believe that the size of small and medium size enterprises (SMEs) is not allowing them to take the most out of synergy which comes from entering into cluster or from collaboration with other SMEs. Even though plasticity of SMEs may be seen as an advantage for their innovations, still very little number of companies are able to move from innovations and turn them into final products or services. It is often the question of resources and abilities at stages of manufacturing and distribution. As a result, SMEs will collaborate with others in order to reduce costs and time that will be required for innovations. Later companies will also receive an access to sales and marketing networks. (Antoldi et al., 2011.)

The objective of this research is to find out what the features and factors which will lead to SMEs collaborating effectively with other external parties within the same industry. In other words, to understand what has to be done within cluster with all its members which will lead to a developed geographical location and economically competitive region. Example of Silicon Valley IT cluster will be used as successful case of a geographic location with members interacting with each other smoothly and communicating effectively.

From the mentioned above objectives, the research question was designed as follows: "*What are the key success factors behind the competitiveness of Silicon Valley IT cluster?*"

The research will be conducted in a form of a case study with the use of secondary sources as a main base of the research. Due to the main objective of the research not being related to any numerical data or statistics the nature of the research will be qualitative.

Structure of the thesis

The following chapters of this thesis will include review of literatures related to such topics as cluster which includes definition, descriptions of actors and most well-known examples. In addition, literature review will explore the concept of competitiveness, how it may be defined on different levels and what are the possible model that can be used to interpret the concept. Lastly literature review will take look at one model which will be used as theoretical framework and will serve as a base for an empirical study.

Literature review will be followed by methodology chapter where this thesis will explain how the research will be done, what kind of data will be used and what will be the methods used to verify it. Next chapters will include presentation of the results in results chapter and lastly thesis will present analysis of the results in the discussion chapter.

2 Literature review

2.1 Clusters

According to Doncheva (2016, 276), clusters are geographically connected concentration of similar, interconnected or complementary companies with active channels for business relationships, communication and dialogue, which share a specialized infrastructure, labor markets, services and face common opportunities for development and threats. In other words, cluster is an accumulation of an end product industry or industries, downstream industries, equipment providers as well as specialized suppliers, service providers, related industries which have essential shared activities, shared skills, shared technologies as well as common channels or common customers. Cluster also includes supporting institutions for instance, financial in addition to training and standard setting organizations, research centers and trade associations. Normally all elements mentioned above complement each other in order to achieve certain economic effect or raise competitive advantages of companies individually as

well as cluster in general. In addition, it has to be noted that in many cases competitiveness of nation or region depends on how competitive are industries and companies that are involved in cluster.

They usually are formed within geographic area with all interactions, communication and logistics being easily accessible. Historically first image of cluster emerged during medieval Europe when traders and craftsmen were gathering around major cities. Clusters promote competition as well as cooperation. They compete in order to get customers, otherwise cluster will fail. Yet there is still cooperation mainly vertically through the supply chain. (Ikram, Fiaz, & Su 2018, 1304.)

Among the well know cluster examples are: concentration of information technology companies in California, aka. Silicon Valley, movie making industries in Hollywood, financial sector in Wall Street, fashion industry in Northern Italy.

Since one of the fundamental tasks of any cluster is to facilitate collaboration therefore so called “gap model” can be applied in this case. The gap model views clusters as group of actors of various types: firms, research institutions, education institutions and government. (Lindqvist, & Sölvell 2013, 12.)

In a made-up idea of cluster everything works perfectly, and all actors collaborate effectively. Government is fully tuned to the needs of companies. Research centers are in constant collaboration with businesses and educational institutions communicate with firms on what will be the best way of providing cluster with all skills and expertise needed. Capital suppliers collaborate with companies to provide necessary capital. (Lindqvist, & Sölvell 2013a, 37.)

However, in reality there are barriers that prevent collaboration. They create gaps between cluster members to distant it from perfect communication. Lack of communication and collaboration in turn leads to decreased level of innovations. A crucial role for cluster is to make connections or “bridges” to connect the gaps within the cluster. Additionally, to mentioned above bridges within cluster, cluster initiatives can also create bridges with other clusters, aka. cross-clustering; as well as between cluster and global markets. Such collaboration allows attraction of talent and investment from outside as well as ability to reach global suppliers and partners. (ibid., 37-

38.) More thoroughly gaps and bridges will be discussed later in chapter theoretical framework.

When talking about reasons for emerging cluster it is necessary to consider all possible benefits that cluster may bring. To begin with one of the major benefits is enhanced productivity. Cluster enables companies to operate more collaboratively and productively by providing a better access to human capital, suppliers, infrastructure and information. In addition, clusters aid in firms' ability to transform by promoting innovation and lowering experimental costs. Constant process of coming and going technical personnel leads to technical diffusion hence accumulating a cycle of imitation and innovation. (Gligor, Rivera, & Sheffi 2015, 243.)

Since companies which are members of a cluster normally strive for advantage in costs, but benchmark of cost efficiency for competition rather results in limitation than innovation. However, once entrepreneur succeeds all neighboring entities will bend over backwards to imitate the success and results. On the other hand, once competition will start to increase and market will get saturated, dropping profit will serve as a motivation for entrepreneurs to innovate. Mentioned above processes will ensure competitiveness of a cluster. (Najib et al., 2011, 57.)

Since clusters are wider than industries, they are able to catch important linkages, complementarities and spillovers of technology, skills as well as marketing and customer needs which pass through firms and companies. Therefore, clusters facilitate a commercialization as well as new business formation. By being viewed as cluster group of companies have an opportunity to coordinate and get improved in areas of common concern without threatening competition. (Long, & Zhang 2011, 113.)

Apart from mentioned above benefits which cluster bring to members internally, strong clusters drive regional economic performance.

Firstly, presence of a strong cluster in a region means constant flow of open jobs therefore, region with cluster will ensure job growth. In addition, expansion of industries within a cluster will lead to a greater new business formation, growth and survival and potentially higher patenting rates. Strength in related industries and presence of region's clusters in neighboring regions will give a resilience in downturns. It

also has to be mentioned that economic diversification occurs within clusters as well as across related clusters. (Vlasceanu 2014, 52.)

There are several steps that are required to draw a cluster map. Firstly, all entities involved in a cluster must be identified including relevant institutions. Then chart of all entities must be created in order to highlight all interactions between them. Lastly, entities from particular areas that are poorly developed or even missing must be revealed. (Fornahl, & Menzel 2007, 13)

What come to composition of regional economies there are two types of clusters: local and traded. Local cluster refer to industries which generally help regional population. Examples of industries that may result in accumulation of local clusters include: health care, food services, residential constructions etc. Although local clusters are interrelated, communicate effectively between each other and are important for well-being of local population they still do not result in injections of money to local economy. (Slaper, & Ortuzar 2015, 8.)

Therefore, there is another type of cluster: traded. These clusters on contrary bring money to local economy since they are manufacturing and sell for those outside of local economy. Due to mentioned above facts local clusters have limited exposure to competitiveness whereas traded clusters are exposed to competition from other clusters as well as other regions and nations. Since traded clusters manufacture and sell to other regions, they attract more skills and talents. Therefore, traded clusters normally have higher average wages and higher rates of innovations. (ibid., 8-9)

When talking about clusters, normally information covers such topics as cluster initiatives, cluster policies and cluster management. Currently modern world is shifting from an old model when government drove economic development through policies, decisions and incentives to a new model with economic development being a collaborative process involving government, companies, educational and research institutions. New model focuses on competitiveness rather than on jobs. In addition, it is built on existing and potential regional and local strengths rather than focusing on just reducing weaknesses. Competitiveness in turn is a result of both top-down and bottom-up processes with various companies and other members taking responsibilities. (Zahradník 2012.)

Clusters are seen as vehicle for policies and investments which support several related companies or/and institutions at once. In addition, policies are used to boost the efficiency and effectiveness of traditional economic policy areas such as R&D, export promotions and attraction of Federal Direct Investment (FDI). Thanks to cluster policies firms of all sizes including SMEs are bridged together. (Lindqvist, & Sölvell 2013a, 43.)

There are several preconditions for activation and development of a cluster. Firstly, a critical amount of companies that are based on local level or subsidiaries of foreign companies who passed the market test. Then meaningful number of cluster-specific advantages such as unique demand or favorable location which are of an importance for cluster. Last two conditions include presence of a strong and multinational company in a cluster which has invested a lot into a region; and strength in a closely related cluster or several clusters. Meeting at least two of mentioned above criteria will result in successful cluster development. (Ketels 2004, 2.)

Life cycle of cluster incudes stages emergence which indicates the beginning and development of cluster. Next cluster moves to maturity stage where cluster is increasing economies of scale. After that cluster will either face resistance and will move to the resistance phase or will slowly decline. (Fornahl, & Menzel 2007, 3.) Speaking of cluster management over time sustainable clustering initiatives have several funding sources, leader who understands so called: big picture. Besides, leader of cluster is motivator and who has an ability of talent spotting. He can move at a speed of business and is able to establish a broad portfolio of initiatives.

2.2 Competitiveness

“A nation or region is considered to be competitive to the extent that firms operating there, are able to compete successfully in the national and global economy while maintaining or/and improving living standards of average citizens” (Porter 1990, 171). It depends on the long-term productivity of location in terms of place to do business by for instance supporting existing firms and workers as well as by enabling high participation of citizens who are part of workforce.

Initial meaning of the word competitiveness refers to striving and rivalry, however original Latin term conveys message of co-operation. This brings a result that even today after many years economists are not able to give to the concept of "competitiveness" a proper definition. Due to such a huge range of definitions an American economists Paul Krugman says that competitiveness is "a kind of ineffable essence which can not be defined nor measured", the word competitiveness has a different meaning when referring to companies, regions or clusters (Dong-Sung, & Hwy-Chang 2013, 58). Even though it may be relatively easy to define term competitiveness in a small case, giving definition of competitiveness on a bigger scale might be challenging. First definition of competitiveness was given by Michael E. Porter in 1990. To his understanding competitiveness is "the ability of the country to create innovations in order to achieve advantages over other nations" (Cvetanovic, Despotovic, & Nedic 2015, 2).

There are several aspects which determine competitiveness both on microeconomic and macroeconomic levels. Speaking of microeconomic level competitiveness is determined by quality of national business environment. Meaning that there is a support for companies from government as well as companies themselves have an ability to grow and develop in a long run. In addition, competitiveness is determined by state of cluster development. Presence of a strong and competitive cluster preferably of a traded nature is likely result in nation being competitive as well. Another determinant of competitiveness is sophistication of company operations and strategy. (ibid., 3.)

There are several aspects that determine competitiveness on both micro and macro levels. On microlevels competitiveness is determined by quality of national business environment. Meaning that companies have support from government as well as companies themselves have an ability to grow and develop in the long run. Additionally, competitiveness is determined by state of cluster development. Even presence of emerging cluster will result in higher competitiveness of an area. Moreover, presence of strong cluster preferably of a traded nature will result in talent and investment attractiveness hence will make region competitive. Competitiveness on microlevel is also determined by sophistication of company operation and strategies. (Schwab, & Porter 2006, 6)

On macro-level competitiveness in turn is determined by sound monetary and fiscal policies. Meaning that both government and central bank have necessary tools including taxes, exchange rates etc. to make nation competitive. Another determinant of competitiveness on macro-level is human development and effective political institutions. One way to measure human development is by Human Development Index. (ibid., 6-7.)

This measure includes several criteria with which it assesses economic development of a nation. It includes such things as mean years of schooling, literacy rates etc. Perhaps the best way to measure competitiveness is by using Global Competitiveness Index (GCI). "Conceptually, the GCI is meant to reveal the extent to which a country's institutions, economic infrastructure, policies and practices are supportive of the level and growth of gross domestic product (GDP) per capita." GDP per capita in turn combines compound data from various national characteristics and "soft" data compiled from the responses to the World Economic Forum's (WEF) annual Executive Opinion Survey." (Bowen, & Moesen 2011, 130.)

In other words, data for Global Competitiveness Index comes from three main categories which in turn have 3 sub categories. First main category refers to basic requirements, meaning that this are key factors which are essential for calculating the GCI. These include: institutions, infrastructure, macro economy. Second pillar is efficiency enhancers, meaning that all sub categories included under this pillar reveal extent to which all categories from first pillar are working efficiently. Categories include: health and primary education, higher education and training and market efficiency. Last pillar is innovation and sophistication are referring to technological advancements. This pillar includes following categories such as technological readiness, business sophistication and innovation. (Schwab 2019, 2.)

The said categories are not considered to be most essential, however they are seen as factors which bring nation to the next level in terms of competition. Before 2003 the WEF assigned the following weights to these three main sub-indices: technology 50 per cent, institutions 25 per cent and macroeconomic environment 25 per cent. However, starting from 2003 WEF expanded its list of countries so that countries with low income will be included. Since those countries with low income are lacking resources for technology related activities, therefore WEF chose to adopt a different

set of weight for such countries. For those countries WEF assigned equally 33 per cent whereas for those countries who are considered to be innovators WEF assigned same percentages: technology 50 per cent, institutions 25 per cent and macroeconomic environment 25 per cent. (Schwab, & Porter 2006, 8)

There are two main models that are used to graphically interpret competitiveness. First, is Diamond model. It was developed by Michael E. Porter who believed that there are 4 key factors which affect competitiveness of country (see figure 1).

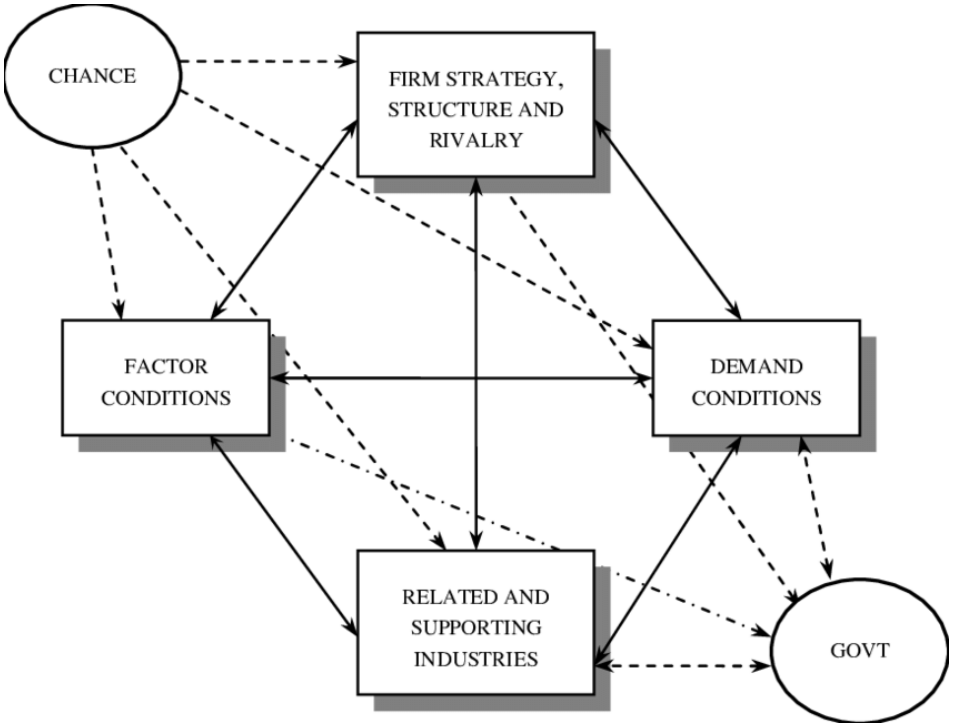


Figure 1 Porter diamond model (Liu, Zhou, & Zhu 2017, 1532)

These are: factor conditions, related and supporting industries, demand conditions and finally firm strategy. There are also two supporting actors including government and chance. All mentioned above factors are not in isolation but influence each other. (Liu, Zhou, & Zhu 2017, 1532.) In case of small regions, strong clusters or "diamonds" from near-by regions can contribute to the competitiveness. Diamond model is easy to understand in general, however the variety of all sub sections included under 4 main sections which were mentioned above are hard to measure.

Therefore, there is another model that can graphically interpret competitiveness. Emerald model was developed by Sasson and Reve in 2012 and it addresses attractiveness of a region with reference to its high education institutions. Current policy makers consider investment into human resource as a key to raise competitiveness. Emerald model includes 6 factors: educational attractiveness, talent attractiveness, R&D and Innovation attractiveness, ownership attractiveness, environmental attractiveness and cluster attractiveness in general (see figure 2).

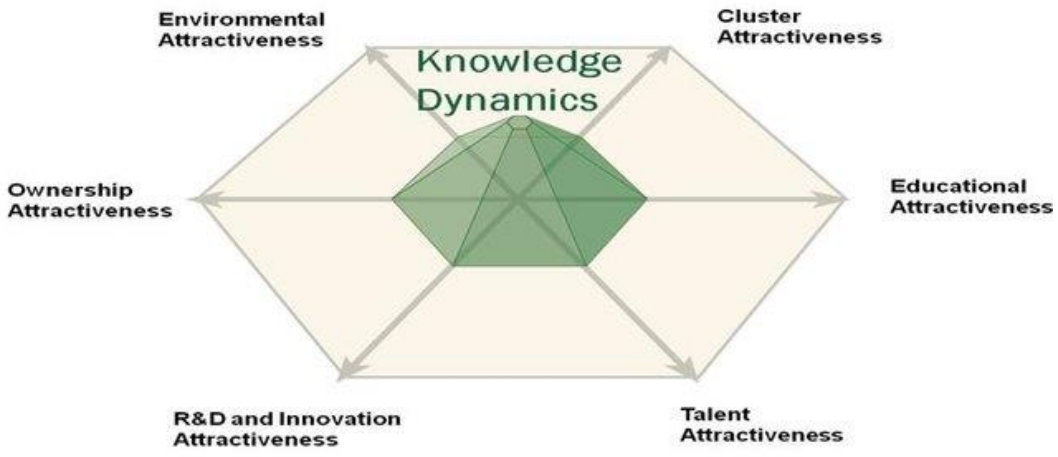


Figure 2 Emerald Model by Sasson and Reve (Sasson, & Reve 2012).

First is educational attractiveness. “This part addresses region’s attractiveness regarding its higher education institutions” (Akpinar, Can, & Mermercioglu 2017, 164). Simply put, it is recognized in the sense of higher education and training. It is included into the pillar of the global competitiveness index as well as sub factor of the world competitiveness index of the IMD. Based on the aspects presented above, following assumption can be suggested. High educational attractiveness level results in higher competitiveness of a cluster. (Akpinar et al. 2017, 164).

Another element of emerald model refers to the attraction of talented individuals to the region. Companies require skilled employees to boost their competitiveness. Attractiveness of workers or “talent” is also seen by Porter as one of the factor conditions for diamond model. What’s more it is also seen as sub factor for labor market by world competitiveness index. (IMD) Based on mentioned above information the

following conclusion can be drawn. Cluster becomes more competitive if it manages to attract talented individuals.

Next in line is R&D and innovation attractiveness. Referring to the level and growth of research & development investments to facilitate innovation performance. Key role of R&D as well as innovation is to enhance competitiveness. It is acknowledged and recognized in other models including (Global competitiveness index) GCI and world competitiveness index in scientific infrastructure sub factor. This lads to a reasonable conclusion: “The higher the R&D and innovation attractiveness of the cluster is, the higher the cluster’s competitiveness will be” (Akpinar et al. 2017, 165).

Next comes the ownership attractiveness which addresses extent to which region is able to provide support to its entrepreneurial ecosystem. As well as previous determents ownership attractiveness is well recognized in other frameworks such as diamond model in factor conditions as well as GCI in financial markets not to mention world competitiveness index by IMD in business efficiency factor. All of the above leads to a conclusion that: cluster can boost its competitiveness by boosting its ownership attractiveness.

Environmental issues may be seen as a source for competitive advantage by maintaining development on sustainable technologies. This will result in the creation of sustainable products and services. Therefore, environmental attractiveness as part of the model addresses companies’ ability to manufacture ecologically-friendly goods and services as a result of ecologically-friendly operations held in the region. Some of other models see environmental aspect as a crucial detail and include it to their models as a separate factor. Therefore, it can be said that greater environmental awareness and attractiveness accelerate overall competitiveness of a cluster. (ibid., 165-166.)

Lastly comes cluster attractiveness in general. Since clusters are geographical concentration of interconnected actors such as companies, research centers, educational institutions, suppliers and others; this dimension concentrates on the extent to which cluster is strong and healthy in general. With a presence of a strong cluster, region will have more potential in becoming more prosperous, in generating innovations and accelerating growth. Impact of clusters on competitiveness is recognized in

such frameworks as diamond model as part of related and supporting industries. Based on the mentioned factors the following is proposed: the higher cluster attractiveness in the state is the higher competitiveness of this cluster will be. (Akpinar et al. 2017, 165.)

2.3 Theoretical Framework

As it has been already mentioned one of the fundamental tasks is to promote collaboration therefore gap model was chosen as theoretical framework for this literature review. (see figure 3.)

Figure 4.2. The Gap Model – the seven innovation gaps

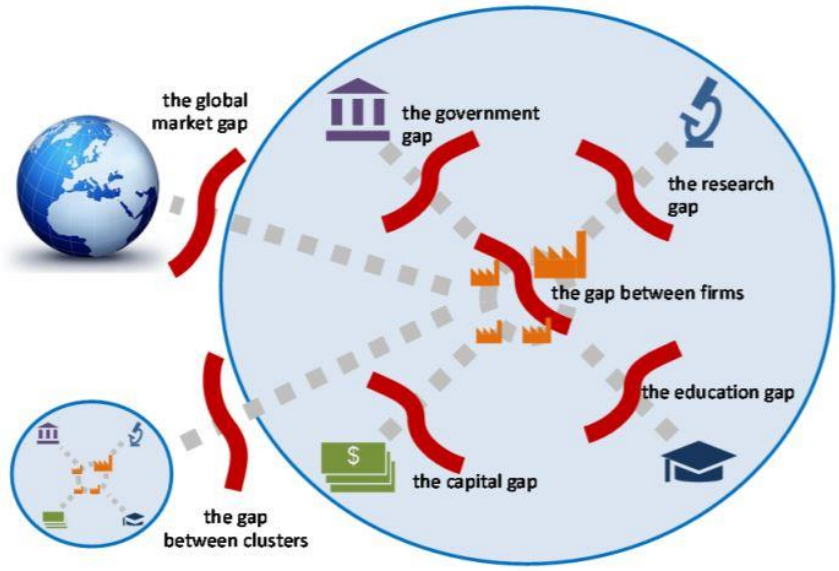


Figure 3 Gap model. Seven innovation gaps (Lindqvist, & Sölvell 2013a, 38)

Gap model refers to seven innovation gaps. Meaning that there are seven various types of actors and in between them there are paths with which one actor can interact with another (Lindqvist, & Sölvell 2013, 38). It also has to be mentioned that out of those 7 factors 5 are internal:

- Companies and education institutes
- Companies and government
- Companies and capital providers
- Companies and research centers

- Companies and companies

However, there are also two external factors.

- Cluster with another cluster
- Cluster with global markets

One set of paths is going between research organizations and companies, another between government and companies as so on. As it has been mentioned in ideal situation all those paths are working efficiently and help make a cluster dynamic. Collaboration guarantees that all resources are used in the most efficient way. Coordination lines up interests as well as actions of various actors. (Lindqvist, & Sölvell 2013a, 37)

However, in reality things do not work like this. Small companies tend to believe that they've got something unique but it is barely possible for them to get access to big firms. When large companies in turn are looking for new suppliers, they would rather look for already established international supplier rather than to pay attention to small innovative SMEs located next to them. Besides, policy makers have unclear ideas about what business actually needs whereas research centers are more interested in academic publishing rather than commercializing their findings. In addition, entrepreneurs find it quite challenging to convince banks to invest into something innovative. It will be more likely that business people will laugh at the idea rather than taking it seriously. (Lindqvist, & Sölvell 2013, 14.)

There is no doubt that connections will not come out of the blue. After all various actors have various roles to play in society. Educational institutions are doing research but not serving R&D departments of companies. Policy makers in turn have other responsibilities which go far apart from what cluster may require.

As for firms, they are there to make profit and not to share unique technologies among each other. Therefore, when it comes to cluster a lot of ideas remain untouched since at first those missed opportunities are difficult to accept. It may seem that the only thing that is needed is a little communication. But communication does not always happen so easily. (ibid., 14.)

If a policy maker receives a phone call from a researcher it will be unlikely that she picks up the phone since she is not eager to listen to deep scientific insights. Same thing goes with teacher and business people. Teacher would rather ask about open spots for graduating students or about organizing a job fair but not to discuss the curriculum. As for outside gaps clusters are not likely collaborate with non-developed regions. They would rather focus on their own growth and competitiveness. Same goes with global markets: small companies have limited access to global markets due to lack of connections. Moreover, even if small and medium enterprises will get some access customers are likely to buy goods from well-known brands rather than testing some newly emerged innovation. (ibid., 13.)

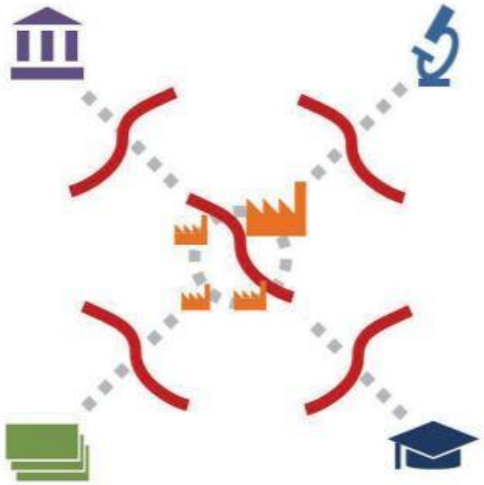
To sum up, this all means that there are multiple obstacles for interaction which lead to gaps between five internal channels within cluster and two channels outside the cluster.

Obstacles like these ones prevent research world from passing the knowledge to the business world. Obstacles make communication slow and complex where it should be easy and quick. They create gaps where there should be paths. Information failure comes from knowledge failures added to networking and collaboration failures but what is usually forgotten is addition of coordination failures themselves. (ibid.,15-16.)

That is why cluster organization arises. Cluster organizations help to increase competitiveness and expand a cluster by bringing various kinds of actors together. They do that by providing activities and meeting places where common concerns may be outlined, discussed and acted upon together. Cluster organizations aid different actors to overcome obstacles and place informational flow along the paths. (ibid.,16.)

There are five gaps inside the cluster, however there are also two gaps that are outside the cluster. (see figure 4).

Figure 4 5 Internal gaps of a cluster. (adopted from



- Research gap: limits interaction between R&D centers and companies
- Education gap: limits interaction between firms and educational institutions
- Capital gap: limited communication between firms and capital providers
- Government gap: limits collaboration between companies and authorities
- Company to company gap: limits interconnection between firms

Apart from 5 internal gaps there are 2 external gaps:

- Cross-cluster gap: prevents communication between two clusters
- Cluster-global market gap: stagnates communication between companies inside cluster and global market

3 Methodology

3.1 Research approach

This research will be of qualitative nature. According to Creswell (2009, 37) qualitative research begins with assumptions, a worldview, the possible use of theoretical lens, and the study of research problems inquiring into the meaning individuals or groups ascribe to a social or human problem. On the other hand, Denzin and Lincoln (2005) believe that qualitative research consists of material practices which make the world visible. To their understanding researchers are studying things in the way they

are and trying to bring understanding of phenomena in terms of meanings people are bringing. Common characteristics of a qualitative research include natural setting meaning that researchers are not brought into any lab but they are collecting data in the ground where they can experience the problem they are researching. In the natural environment interaction prevails on the face-to-face basis. (Creswell 2009, 37.)

Coming down to another part of research approach there are two kinds of tactics researcher may take: deduction and induction. According to Saunders et. al. (2006, 117) deduction goes along with scientific research as it involves theory development which in turn will have to be put under a test. Stages of undergoing a deductive approach include designing of hypothesis from the main theory and putting it under a test. Later comes an examination and analysis of the outcomes and modification of the theory in the light of outcomes. (ibid., 118.)

Given the fact that my research will not be based on the theory testing as well as there will not be a need of explaining relationship between variables; inductive research approach will be used in this thesis.

Moving forward with the research design, since the purpose of this research is to find out how good communication between various actors within the cluster can enhance cluster's competitiveness, the research will be based on exploratory. According to Robson (2002, 59) "an exploratory study is a valuable means of finding out what is happening, to seek new insights, to ask questions and to assess the phenomena in the new light."

Saunders et. al. (2006) give three major ways of carrying out an exploratory research. Those three involve collection of relevant literatures, interviewing people who are considered to be experts in the field of research and conduct focus group interviews. (134-135.)

Since my research is taking into consideration several aspects while conducting a research, exploratory study is the best option since it is flexible and can be adjusted in case new data outcomes will bring changes. In addition, absence of the strict design allows the research to have a look on the same aspect from different angles.

3.2 Research context

The context of this research is Silicon Valley IT cluster. It evolved as rich network of interconnected parties including large multinational corporations, small-medium enterprises, Venture Capital funds, lawyer offices, trade publications, universities, and research centers.

Speaking of current state of Silicon Valley from economical point of view, San Francisco Bay Area has the highest density of information technology companies in United States. From 387 000 jobs in a high-tech industry located in USA 225 300 are located in Silicon Valley. In addition, Silicon Valley has the highest concentration of workers employed in high-tech industry. Not to mention that Silicon Valley has the highest average wage rate in United States. (American Electronic Association 2008.) According to Forbes journalist Elizabeth Eaves (America's Greediest Cities, 2007), San Jose along with Santa Clara and Californian Metropolitan area has the highest concentration of millionaires and billionaires in United States per capita. San Jose is seen as the biggest manufacturing area in the sphere of Information technology with unemployment rate of 7.8 per cent (Brown 2016).

Silicon Valley leadership positions ae occupied mainly by men which is also represented in the amount of new companies that are found by women not to mention the number of women-leading start-ups. Such situation had led to various dissatisfactions among women as well as American citizens living in the near-by regions. (Matthews 2002, 145.)

Speaking of educational attractiveness, and especially about higher education several world's best universities are located in different regions of Silicon Valley including Stanford University which had be collaborating with business entities since first small companies were established in the region of San Jose. In addition, it serves as one of the biggest and important research centers of Silicon Valley. Another, universities located in the southern end of San Francisco Bay area include San Jose state university as the oldest public university, Santa Clara University which is ranked as one of the best universities in the Western part of United States. Mentioned above educational

institutions are playing a role of a magnet attracting tens of thousands of highly educated individuals both from all states in America as well as from other parts of the world. (Sturgeon 2000, 98.)

From legal perspective Silicon Valley is one of the regions where legalities are seen in the form of intellectual property. Due to the fact that numerous innovations are being developed on a daily basis, it is vital to provide supporting ventures that would deal with patent registrations and intellectual property protection.

3.3 Data collection

When it comes to collection of data, it has to be noted that there is primary data and secondary data that can be collected and later analyzed. Saunders et. al. (2006, 256) define secondary data as data that had already been collected for other purposes. Although secondary data is not considered to be fresh, it can help researcher to answer the research question. It includes raw data as well as published summaries. There are three sorts of secondary data: documentary, multiple source and survey. Since this research is qualitative by nature, qualitative secondary data will be collected and used as a base for the analysis. Both documentary and multiple source data will be used in this thesis. Documentary secondary data refers to the research projects and include written materials such as minutes of meetings and notices. It also includes what is not written, like voice and video recordings. (ibid., 258.)

Giving the fact that there is plenty of publications had been released about Silicon Valley IT cluster and its members, non-written documentary data as well as multiple source secondary data will serve as a base for the data collection.

Speaking of nature of data, there are two sets of data that can be collected for the research. Quantitative data and qualitative data. In other words, it can be either numbers or words. Saunders et. al. explains (2006, 151) that distinction between quantitative and qualitative data, is that quantitative data is a synonym for any data collection technique which deals with numbers and produces numerical outcomes. Examples include surveys, graphs. In contrast, qualitative data deals with techniques which uses words as a tool and produces words as an outcome. Most common example of qualitative data collection technique is interview.

In this research mono method will be applied when collecting data. Meaning that research will combine single qualitative data collection technique and qualitative data analysis activities.

3.4 Data analysis

When it comes to data analysis this research will focus on the analysis of qualitative data. Theoretical framework will serve as a base for grouping and analyzing the data.

Since the model which will serve as a frame of the analysis consists of 7 subgroups each subgroup will be dealt with independently and conclusion will be made out of each sub group. After all the sub categories have been analyzed one general outcome will arise and form general conclusion which in the end will serve as an answer for a research question.

Speaking of difference between quantitative and qualitative data, when it comes to analysis, Robson (2002) points out that qualitative data is characterized by its richness and the extent to which the researcher was able to explore the subject as deeply as possible. Therefore, description of qualitative data is usually much more through than description of quantitative data.

Table 1 The differentiation between quantitative and qualitative data.

Quantitative data	**Qualitative data**
Based on meanings that are coming from numbers	Based on meanings expressed through words
Results are collected in numerical and standardized way	Collected data requires classification due to its complex nature
Analysis is developed with the use of statistics	Analysis is executed through the conceptualization

On the other hand, when analyzing qualitative data, it will most likely have to be grouped due to its complexity and unstandardized nature. Without grouping and categorizing data researcher will be able to get only a vague representation of what

data means. Robson also suggest the usage of graphical interpretations to measure the frequency of occurrence of specific outcomes.

3.5 Verification of the results

Internal Validity

Throughout the whole research process from formation of research question till the analysis the results several strategies were used in order to ensure the validity of the research. First, the engagement with the topic and the case used in the research as well as clarification of researcher bias. (Creswell 2007, 207.)

All of the above-mentioned strategies will be now deeply explained.

Continuous engagement with the topic was developed throughout the major course at the university which was taken by author during the first semester. It included studying of the concept which is used in this thesis from different perspectives as well as giving valuable practical examples through the discussion of several case studies. Moreover, execution of the practical tasks related to the concept that is researched in this thesis also contributed to the engagement with the topic.

Speaking of the case that is used in the research, the engagement came as a result of a presentation given by lecturer and a knowledgeable person in the field combined with an intention to get deeper insight to the topic which had been constantly mentioned by various researchers.

Lastly, the check from the knowledgeable person in the field in which the research is made was used as a strategy to ensure the validity of the data. Throughout the literature selection

As a creator of this research I understand the bias in carrying out this research. Despite the fact, that concept that is being researched in this thesis was widely explored during the course, I am not an expert in the field; moreover, the case that is used in this research can not be easily accessed physically therefore, is not allowing to have a detailed picture of it. This fact may affect the conclusions that will be made in the results.

External Validity

Due to the fact that the findings of this research are intended to find out why Silicon Valley IT cluster is more competitive than others and if the strategies that had been successfully implemented in there can be implemented in other clusters of the same industry. Therefore, the findings that will be presented in this thesis can be generalized to the context of the competitiveness of cluster in the IT sphere.

However, since Silicon Valley IT cluster is geographically located in the prosperous nation, with high level of economic development, the extent to which the findings can be generalized is limited to the clusters in the IT industry that had been developing for a long amount of time and already have a base in terms of cluster members and operations that are going on within it. Clusters with a vague base or the ones that are only going through the accumulation of organizations with similar industry.

Reliability

Another strategy that was used to ensure the validity of the data was triangulation. According to Saunders et. al. (2006, 139) triangulation refers to the usage of several data collection methods in order to see if the data that had been collected refers to what it supposed to refer. In case of this research, the major share of data will be coming from secondary sources. In order to ensure reliability of the data, all information that will be obtained and analyzed will be supported with graphical representation. In other words, figures with numbers will be used as a numerical support of the presented facts.

Additionally, as it had already been noted secondary data provided the biggest share of input concerning the subject of the research. The reliability was ensured by usage of academic resources obtained in the libraries as well as by seeking advices from people with expertise in the required area.

Objectivity

Wide variety of secondary data available on the subject of the reseach combined with the large number of sources available about the case that was used in this research allow other potetial researchers interested in the topic to obtain similar findings for the question researched.

During the analysis of the data theoretical framework was used to catergorised the data and group the information according to each sub category of theoretical framework. Correct analysis techniques were utilized in order to reach the reasonable conclusion.

4 Results

Primary aim of this chapter is to outline the outcome of the carried-out research. After executing a thorough analysis of the sources related to the topic, this chapter will present the characteristics inherent for Silicon Valley IT cluster which in their turn drive the competitiveness of the above-mentioned region.

In order to present the facts in more detailed manner as well as to provide better understanding of the data, the results will be framed in a way that general picture will be described where key behaviors will be outlined. Afterwards, results will be divided into separate categories and presented according to certain subgroups for the sake of phased analysis and to cover a wider range of facts.

A GAP model which was used as a theoretical framework and explored in chapter 2 will be used to categorize the data. The reason to use the model as a means of dividing the outcome of the research is that model itself presents the “gaps” or the specific spots that are being addressed in the main research question of this work. In other words, the model will allow to clearly identify the gaps between numerous cluster members, and as a result the collected information will easily fall into places as it will serve as the “bridge” to close the “gaps”.

It also has to be noted that although inside the Silicon Valley IT cluster various companies of various sizes are present, however in this chapter the emphasis will be made towards small and medium size enterprises aka. SMEs. Main reason for that is the fact that although such IT giants as HP, Microsoft and Google are playing a vital role in the competitiveness of the whole cluster, they have already reached the level of maturity and accumulated enough resources to separate themselves and become a mini-clusters themselves.

On the other hand, SMEs are the ones that drive the competitiveness of the cluster since due to favorable conditions of all sorts the number of small companies and start-ups that gets registered there is climbing therefore boosting the innovation level inside the region.

It has to be noted that Silicon Valley success is something that exists there as not a just one time happening but rather as a routine or a behavior. For instance, people in Silicon Valley who are either studying there or coming there to start a company have this synergy of ambitions and goals that later grows and leads to conscious steps in order to achieve their milestones. Combined together with an "entrepreneurial process" or a desire to chase the opportunity regardless of any limitations leads to the second phase, constant inflow of companies and start-ups and innovation level increasing. (Engel 2015, 38.)

In addition, it is not enough to just have a brilliant idea to become a number one, one would need an access to resources. And this is again something that Silicon Valley has established on a behavioral level: the mobility of such resources as people, capital and information allows a full access to a wide range of opportunities for multiple enterprises at the same time. Moreover, technologies that are already existing do not just sit inside one company developer but rather gets spread to others to ensure a constant inflow and outflow, meaning that innovations do not kill the communication and collaboration but make them work to make their lives easier. There are many other examples that can be given here to showcase but most importantly it is strategic global perspective, meaning that everything and anything that is created in Silicon Valley be it an innovation, it has a clear goal of going out for a global market or a start-up with a strong ambition of becoming an international stock listed company. (Engel 2015, 37-38.)

Another factor that distinguishes Silicon Valley is the ability for a rapid change and adjustment. Historically, since its formation Silicon Valley had switched from one area of expertise to another. From semiconductors to hardware to internet and social media. It has never been stable and stagnated. It can be said that such ability to adjust to any radical changes are tightly integrated with an every-day life of the IT cluster. (ibid., 39.)

The reason for these shifts in the focusing areas of Silicon Valley is a rise of brand new newly emerged companies. At the beginning such company as Hewlett Packard and IBM made a huge boost when the era of computer was on its rise. However, after several years computing industry was so well developed so it was time for something new to arise. This as the time when companies like Apple and Google came into game. Each of those companies brough something completely new which hasn't existed before. One discovered the internet and the other brough in the means of comfortable and quick usage of the first. Today in the era of social media giants like Facebook, LinkedIn, Instagram are once again bringing to the Silicon Valley something that is yet to be fully developed and therefore is driving the level of innovations and hence competitiveness to the new levels. (Fung 2017, 195.)

One more factor that perhaps acts as a magnet for people from all around the world is that Silicon Valley "tolerates failures". In other words, in case of a failure there are multiple ways to re-enter the career of entrepreneur. This is what acts as a catchy aspect for many people, if one idea didn't work one can just switch to another and will get as much support, both finance and resource wise, as for the previous one. On the other hand, if the idea was risky but turned to be successful, the reward will be worth it. (ibid., 197.)

After general factors distinguishing Silicon Valley IT cluster have been presented, chapter will be categorized according to GAP model. Each sub group will present the results concerning the communication between SMEs and one cluster member starting with educational institutions, government and so on.

4.1 SMEs and Education institutions

When talking about relation between SMEs and education institutions, firstly it has to be said that there are at least 3 universities located in or around Silicon Valley. For instance, Stanford University. Located in the proximity of Palo Alto university is believed to be the heart and birthplace of the Silicon Valley that everyone knows today. Founded in 1885 Stanford University was the first one to have graduates who started their own company. Bill Hewlett and David Packard who both were graduates of Stanford and got some financial support from their professor started to develop

something that nowadays almost everyone has at home-computer. (Kushida 2015, 7.)

Next one in line is University of California Berkley located on the other side of the valley. Founded in 1868 Berkley is the oldest campus of the entire Californian block of universities. Additionally, just like Stanford the university has been ranked among 10 top universities internationally. Last but not the least there is San Jose State University is ranked among of the top universities of the world and supplies Silicon Valley companies with workers on regular basis. (ibid., 7-8.)

On the figure below (see figure 5) a map of the Valley represents all of the major universities along with some of the biggest corporations. As it can be seen San Jose and Stanford are located directly inside the Silicon Valley. Others have their campuses located outside the valley, yet in the proximity to it.

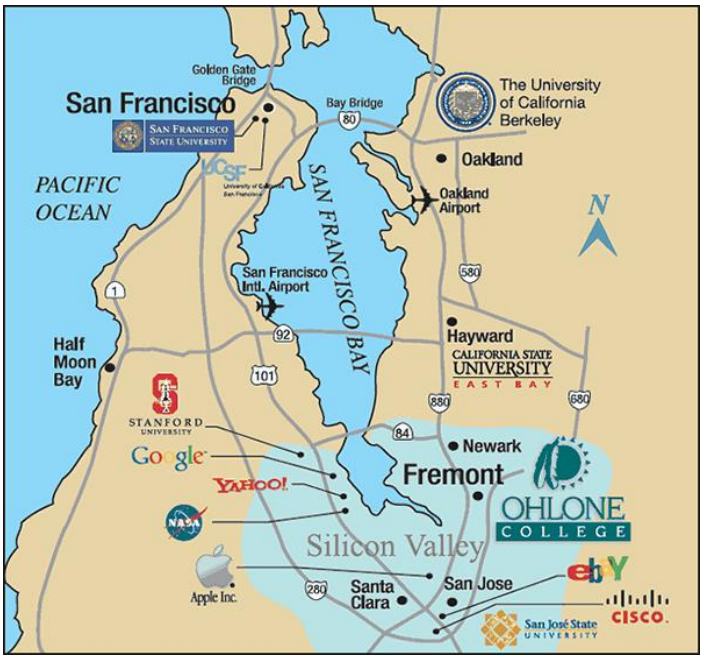


Figure 5 Geographical location of universities in Silicon Valley.
(adopted from Ohlone college)

Another figure (see figure 6) is mentioning the rank of top ten universities in the world by World Economic Forum. As it can be seen nearly 80 per cent are located in the USA and two of those are located in the Silicon Valley.

The world's top 10 universities

WORLD ECONOMIC FORUM
COMMITTED TO IMPROVING THE STATE OF THE WORLD

Rank	University	Country
1	Harvard University	USA
2	Stanford University	USA
3	MIT	USA
4	University of Cambridge	United Kingdom
5	University of Oxford	United Kingdom
6	Columbia University	USA
7	University of California, Berkeley	USA
8	University of Chicago	USA
9	Princeton University	USA
10	Cornell University	USA

Source: Center for World University Rankings, 2015

Figure 6 Ranking of international universities. (adopted from Center for World University Rankings 2015)

Coming back to the factors that enhance the communication between the SMEs and education institutes it has to be said that perhaps the biggest bridge here is infra-structure. It starts with universities providing everything and anything their students might be needing e.g. office spaces, university facilities even financial support in some cases. Moreover, since most of the companies and start-ups are created by graduates from those very universities the gap between them is almost invisible since in the end almost every company that was created and almost every innovation that comes out of the start-up has been developed by university students and quite often with the aid of their own professors. (Dud'. Silicon Valley 2020.)

Another factor the bridges the gap between SMEs or/and start-ups inside the Silicon Valley is the strong network of connections and high mobility of information. Net-

work between the SMEs and universities within the cluster represent a cyclical relation. University supports enthusiastic students to become entrepreneurs. Students and especially graduates would pass the information to their friends who are either having their own companies or working somewhere to connect with the university and by doing that would provide an opportunity to have a constant inflow of talented workers. Therefore, the workforce in the SMEs and start-ups that are located in the IT cluster is made up of primary the same students or graduates or even professors who were either teaching or studying in the very same university. (Dud'. Silicon Valley 2020.)

Lastly, it has to be noted that what distinguishes ecosystem in Silicon Valley from other IT clusters is the fact that ecosystem inside the cluster ensures that "gaps" between various cluster members are "bridged" tight. In other words, universities ensure the inflow of top-class students to the SMEs with their strict selection process and high competition between the students. (Dud'. Silicon Valley 2020.)

4.2 SMEs and Government

Historically U.S government was playing a role in the life of Silicon Valley before it became world's largest IT aggregation. During the Second World War engineering projects were funded by military side of government as well as science labs were receiving financial support from the national authorities. Those military contracts helped to establish the initial frame of the IT agglomeration that exists now. Perhaps, the most well-known example of cooperation between SMEs ang national authorities is the case of Hewlett and Packard. After the company successfully created a first version of computer, they received a contract from military side of the national government to implement their technology to provide aid for military forces. (Engel 2015, 39.)

It also has to be mentioned that government served not only as a provider of contracts and subsidies for innovation development, it also served and still serves as one of the biggest customers for both SMEs and start-ups. By closing the deals with SMEs for their services and innovation authorities ensure the constant inflow of top-class innovations for various industries as well as create a strong bridge between the cluster and the rest of the country.

One of the strongest channels that bridge SMEs in Silicon Valley and governmental bodies is aeronautics and aerospace area. Companies such as Lockheed-Martin were the largest employer with numbers going as high as 28000 people during the post war era and remaining among the biggest players up until modern days. Most of its sales went to government. (Kushida 2015, 13.)

Although today it is complicated to maintain a solid bridge between SMEs and government itself, start-ups of Silicon Valley are continuously working with government related agencies such as National Aeronautics and Space Administration, Central Intelligence Agency and others.

It has to be noted that bridge between the SMEs and government can be seen in various ways, for instance, since many of Silicon Valley companies have international workers government played a vital role by focusing on immigration reform allowing more internationals come to US for job related reasons. (Golomb 2014.)

The figure below (see figure 7) graphically represents employment in different regions of USA. Each line in its turn is categorized by industries employees are working in. According to it, in 2015 Silicon Valley had the biggest number of workers employed in such industries as Software, Aerospace and specialized innovation services. Out of this, conclusion can be made that bridge between SMEs and government brings mutual benefits. In other words, SMEs benefit by receiving top skilled specialists and government in turn receives good results in growing innovations and hence exports.

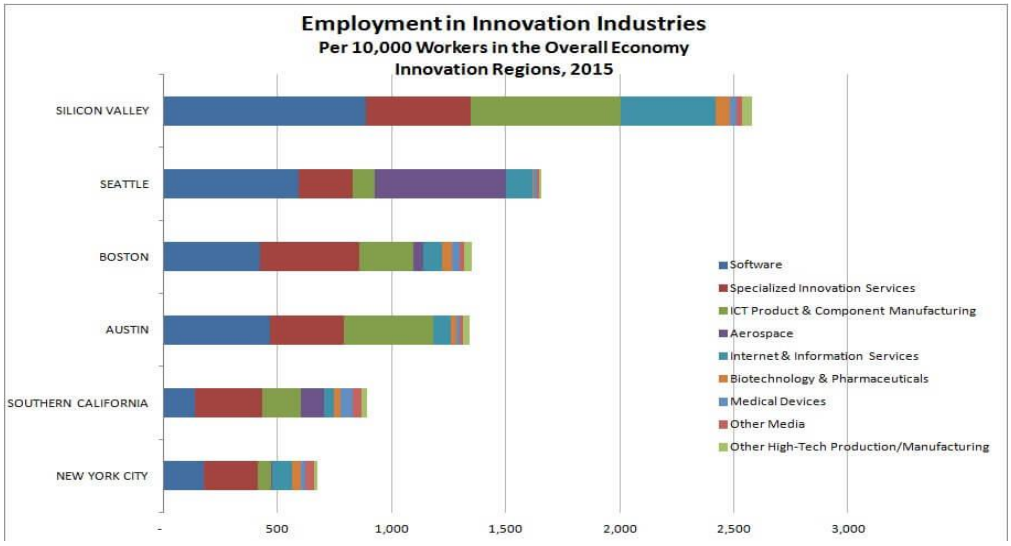


Figure 7 Statistics on employment in US by regions. (adopted from Silicon Valley Competitiveness and Innovation project 2016

From the figure below (see figure 8) it can be seen that between the years 2012 to 2015 there had been a massive increase in the development of new innovations. Thus, a conclusion can be made that a bridge between the SMEs and the government represents the cyclical relation.

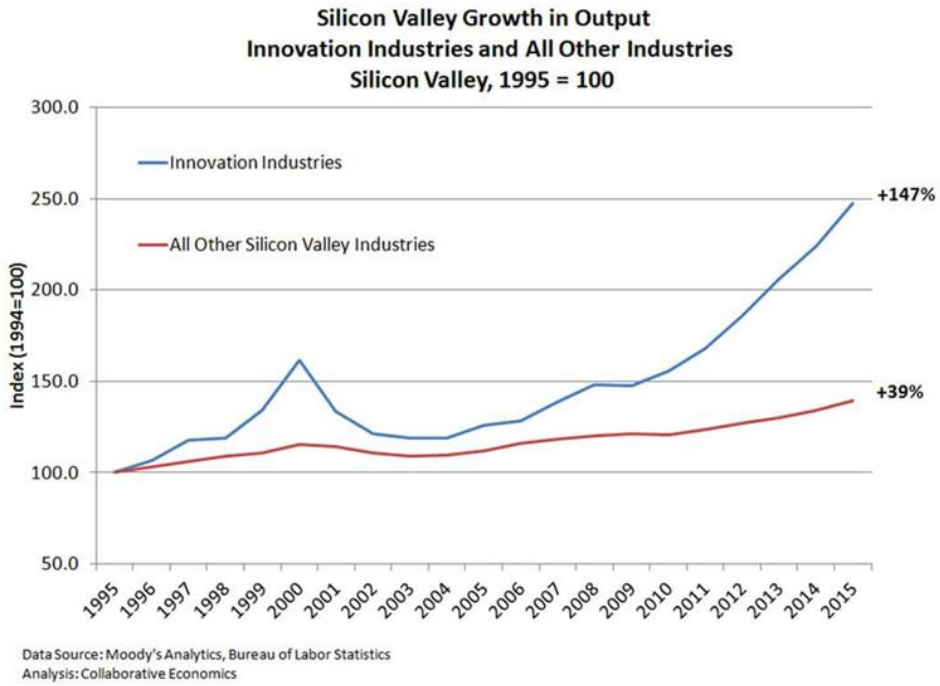


Figure 8 Silicon Valley growth in innovations. (adopted from Silicon Valley Competitiveness and Innovation project 2016)

Apart from simplifying the visa regulations for international employees; government made its input by considerably lowering capital gain taxes from 49.5% to 28% (Kushida 2015, 33). This made it possible for SMEs and especially Strat-ups to gain high revenues out of their products and innovations.

4.3 SMEs and Capital Providers

When it comes to capital providers Silicon Valley is full of institutions as well as individuals who are keen on supporting enthusiastic individuals on their way to success. Historically first start ups in Silicon Valley were not supported by investment companies but rather by already existing corporations. Later in 1950s 1960s such start ups as Hewlett-Packard and Varian became first to receive funding in a form of investments. In addition, it has to be said that once professional investors appeared, they were usually investing their own capital or capital from larger institutions such as

pension funds. In a last decade venture capital investment in the US was 30 billion USD per year with roughly one third of it going to Silicon Valley. (Engel 2015, 41.)

it can be seen that during the last decade Silicon Valley was the largest pool for venture capital investment and reaching its peak in the years 2015-2016 (see figure 9).

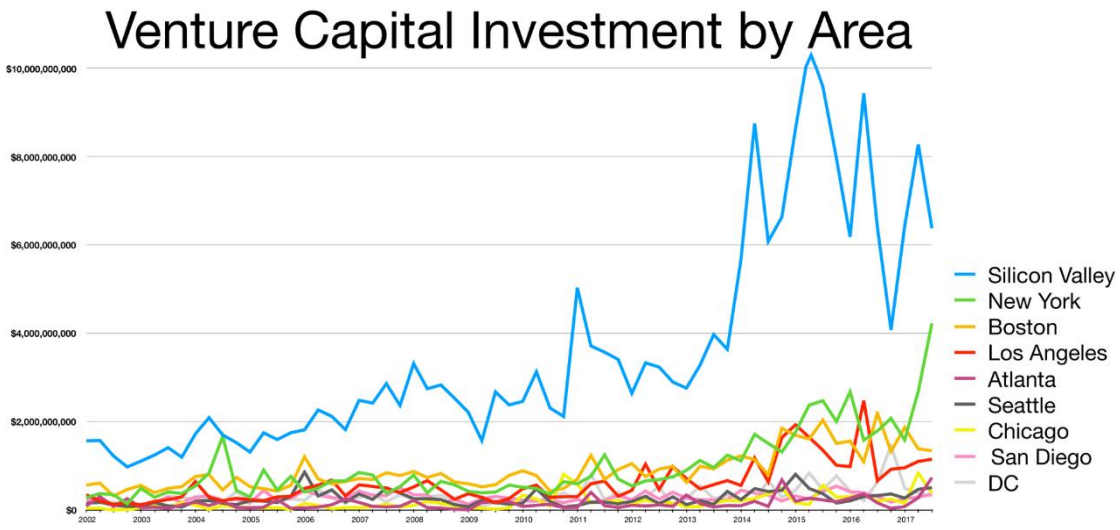


Figure 9 VC investment by Area. (adapted from Wikipedia)

Both structure of VC firm and VC investment affect the behavior in Silicon Valley. Framing VC investment by staging financing and announcing the preferred stock for investors VC firms initiate start-ups and SMEs to quickly create a value, grow the company and exit early. Investors fast-track the innovation development through diverse government related activities, and through creation of compensation policies to be able to match economic interest of all employees with that of investors. An example that secured this pattern was a case of Apple when an initial price offering made around 300 millionaires out of their employees. (ibid., 41.)

Another factor that drives SMEs and start-ups coming directly to venture capital investors and not banks is the fact that VC investors tolerate risks, due to the fact that they investment is normally in the form of equity. Traditional banks do not favor capital gains which can put the loan amount at risk, investors on the other hand do enjoy the capital gains. However, it has to be noted that since the largest share of their investments is likely to fail, VC investors normally protect themselves by demanding

being in the company's management. Usual practice involves VC investors joining the board of the SME and even becoming the chairman. By doing this investor is not only ensure some sort of stability but also substantial aid for SME's development.

Another good factor which suggests a strong bridge between SMEs and venture capital investors is once again the mobility of information and the employees working in a company. Although todays Silicon Valley is divided into several regions such Palo Alto, Santa Clara and others, those are mainly full of other cluster members rather than VC companies. These firms along with other capital providers aggregated their offices around Sand Hill Road and surrounding areas. (Jones, McCarney & Skolnik 2005, 219.)

Lastly, another factor that bridges SMEs and capital providers is the possibility to find an investor on any stage of company's development. Initial stages of start-up funding are so called "seed funding". Those are normally used just to help the company get going. Those are followed by early stage, expansion and late stage of funding.

As a conclusion it can be said that like in other cases, the relation between SMEs and capital providers works with the principle of mutual benefit. In other words, the bridge between them ensures that everybody wins in the end.

4.4 SMEs and Research & Development centers

Research and development centers started to appear in Silicon Valley once it started to expand geographically. Before it was mostly federal funded research labs which were doing all research work, however once such start-ups like Hewlett-Packard, Cisco grew into a size of mature corporations they had built their own research centers close to headquarters to ensure rapid exchange of information between the R&D center and the center of innovation and commercialization.

Other research centers are normally started inside the university facilities such as Stanford Research Institute (SRI). Those provide the cluster with skilled technicians and on top of that, those R&D centers are tightly bonded to SMEs since a lot of new ideas and ventures emerge out of there.

SMEs and research and development centers are bridged through universities where the centers are located. This can be done in multiple ways.

To begin with SMEs can hire graduates from the university or from the research institutes which is part of a university. Such graduates not only have the skills company might need but also an expertise in doing academic research. This will result in SMEs being able to develop a new innovation and hence generate greater revenues. Since newly graduated students have an ability to think outside the box and approach the problem from a completely different angle hence creating a possibility to either improve some already existing innovation or make something from scratch.

Secondly, if an SME requires an additional research support due to being at the early stage of business activity, they can utilize facilities of research institutions instead of spending their assets on federal research centers. Moreover, geographical proximity between a research center and an SME will accelerate the invention development.

Thirdly, an SME can benefit from research institutes but sponsoring the merged projects between university and industrial research centers. With this SMEs are getting access to research facilities and more importantly information which they can use to commercialize one or another invention and turn it into innovation. (Bania, Eberts & Fogarty 1993, 762.)

Another way of bridging the gap between industrial research centers and SMEs is through patent registering institutions. Once the invention has been discovered it is crucial to check whether anyone else had claimed a patent on any similar innovations. If not then an individual or an SME can apply for a patent with their invention, once approved innovation belongs to the owner of the patent and only the company holding the patent has the right to develop the product/service further or commercialize it. Patenting activity of not only the region where companies are operating will grow but of the entire state, in case of geographic proximity between university research center and industrial research institution. (ibid., 762.)

It can be observed that state of California has the largest accumulation of patent applications. Moreover, from the figure below it can be seen that according to the graph the majority of those applications are coming from San Jose area (see figure 10).

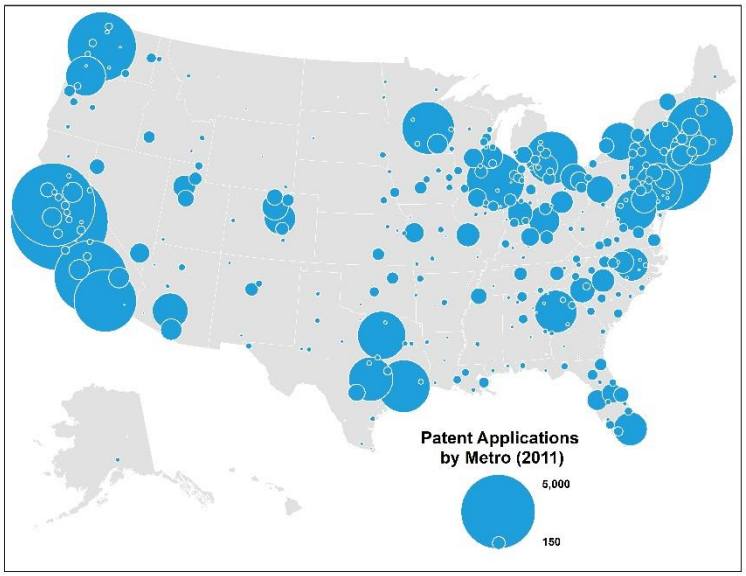


Figure 10 Map with patent applications in US by state. (adopted from Where America's inventors are 2013)

it can be seen that in 2011 there was a significant growth in the number of patent applications, this explains the rapid recovery of SMEs in the region after the world crisis of 2009 (see figure 11).

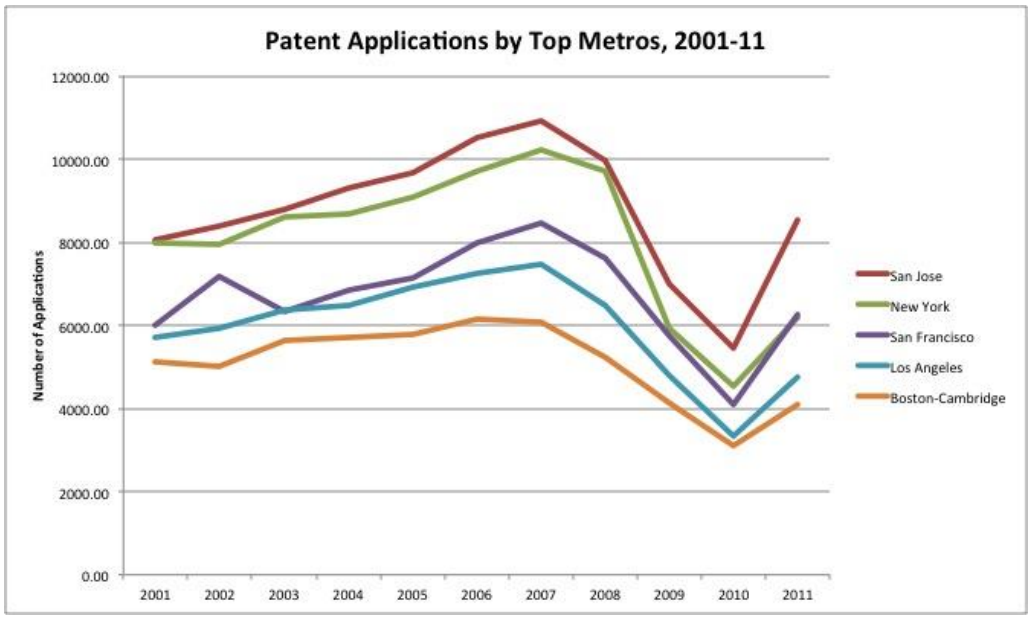


Figure 11 Patent application in USA by region. (adopted from Where America's inventors are 2013)

As a wrap up of this sub chapter it has to be said that in this bridge the processing speed of information plays vital role, especially when it comes to patents and patent

applications. SMEs have to be in proximity to research centers either industrial of university based in order to achieve best outcomes in a form of inventions and later innovations and products/services.

In addition, unlike in other sub chapters here bridge between two cluster members does not represent a cyclical pattern but rather a process since Research centers work on conducting exploration in multiple fields and creating an invention, but its SMEs who turn those into innovations.

4.5 SMEs and companies

When bridging SMEs with other firms it has to be noted that there are various types of ventures inside the Silicon Valley IT cluster. There are giant multinational corporations (MNCs) such Apple, Microsoft, Facebook etc. Additionally, there are small and medium size enterprises (SMEs) and also there are start-ups.

One way of bridging SMEs with other types of companies is through the mobility of resources. Since IT is highly competitive numerous start-ups emerge and die out on daily basis. Therefore, employees of failed ventures do not just sit around but rather move around between counties of Silicon Valley looking for new opportunities and a way to expand their network of connections. It is common that MNCs in pursuit for talented individuals will hire technicians from failed startups. (Kushida 2015, 7.)

It also has to be mentioned that large corporations are bridging with firms of other sizes not only by acquiring specialists from startups and SMEs with the help of information flow, but also provide needed resources to accelerate startup's growth.

Another factor that bridges SMEs with other companies inside the cluster is service providers. Silicon Valley is full of various ventures such as lawyers, recruiting firms etc. With such a developed business infrastructure companies can not only hire top class professional and protect their intellectual property but also establish long lasting connections in between (Engel 2015, 44.)

4.6 SMEs and Global Market

As it has been mentioned before, there is high competition level inside Silicon Valley. Many SMEs are looking for ways of rapid growth and quick exit; therefore, they have

to target larger markets where competition is low and there is a chance of high returns. In addition, desire for huge returns makes entrepreneurs to face international markets for opportunities, skilled employees and financing. International connections and network are something that boosts Silicon Valley's agility. For startups access to global market is even more vital as they would need anything that they can get to utilize the idea turn it into innovation and commercialize it. (Engel 2015. 44.)

Global cluster of Innovation Framework identifies three categories of linkages that can be found within Silicon Valley: weak ties, durable bonds, covalent bonds (ibid., 45). If put into simple words weak ties in Silicon Valley are represented by communities of international immigrants. Among biggest are Indian and Chinese communities since a majority of international employees are coming from China and India. Additionally, the fact that international employees can freely move between Silicon Valley and their home country also enhances strength of international ties. (See figure 12).

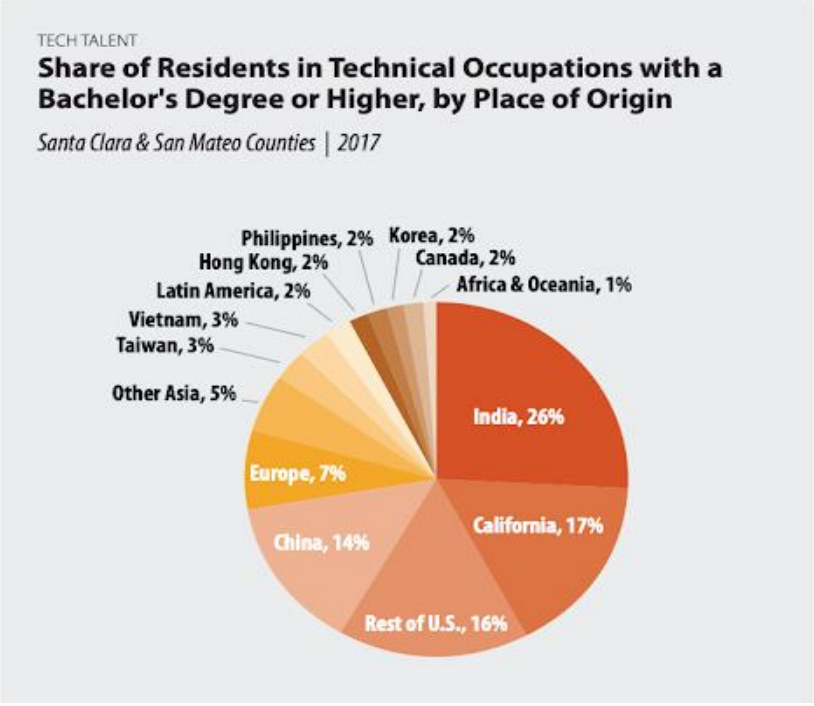


Figure 12 Share of residents in technical Occupations. Santa Clara 2017. (adopted from AsAmNews 2019)

As it can be seen from the pie chart the biggest international community is India representing 26% followed by Chinese with 14%. It is quite common that international workers can seek other opportunities while continuing their employment in United

States and as a result expanding the network through family-friend ties. In turn such connections can lead to a long-term contracts or employment relations.

Another bridge between SMEs and global market is through Multi-National Corporations (MNCs). Corporations such as Apple, Google, Amazon which were once startups as well provide SMEs doors to global market in various ways. (Kushida 2015,11.)

Firstly, corporations can just take a role of a regular customer and then pass customers to startup. Another way for a large corporation to bridge SMEs and markets is by acquiring the SME through mergers and acquisitions (M&A) strategy. In other words, corporation would provide its resources for a SME to achieve greater success from their idea than SME had anticipated.

One more way that bridges the gap between SMEs and the global markets is through government acting as buyers and thus opening doors to global markets for startups and SMEs. (ibid., 11-12.)

As it was already mentioned in the part about relations between SMEs and government, authorities often play the role of primary customer, especially in the area of aeronautics space industry.

As a wrap up it has to be said that bridge or a “door” to global markets for startups and for SMEs in Silicon Valley are opened through multiple various actors. The bridge here has a characteristics of spider web where Silicon Valley is a spider and all the connections and channels are the strings of the hug web.

4.7 Silicon Valley IT cluster and Bangalore IT aggregation

Once connections inside the cluster grow stronger, they are likely to expand and grow to inter-cluster relations. Cluster to cluster bridge is not just relation between two actors but rather an ambition of utilizing all resources from both sides in order to execute common projects. Inter-cluster bridges are normally created and maintained by individuals with established presence in both places, moreover, those individuals have an ability to maintain this presence in both clusters simultaneously. Common characteristics of cluster to cluster relation is increased flow of information, cuts the

transaction costs. Operations of business in one cluster become included into activities of businesses of another. Such connections would imply joint values, tight business incorporation.

With both weak, durable and covalent bonds being strongly developed inter-cluster communication reaches new level as clusters begin to have a lot in common such business activities. Efficiency reaches such levels so although clusters are geographically located in different parts of the world, they act as one synchronized aggregation.

There are already existing strong cluster to cluster connections related to Silicon Valley IT cluster. For instance, Silicon Valley/Israel high tech connection. (Engel 2015, 46)

It has to be noted that potential of creating another cluster to cluster bridge between Silicon Valley IT cluster and Bangalore IT region is growing in recent years.

Bangalore started developing as IT hub in 1951 when IBM came there to built a subsidiary to produce accounting machines. Other IT companies entered India around the same time and were hiring employees from Bangalore as well as from other parts of India. In 1972 Indian government issued a new software export policy to encourage firms exporting software to invest into industry. Eventually IBM as well as other foreign companies left India leaving it with a pool of talented engineers and a demand for company's products. (Karna, Sonderegger & Taube 2011, 8.)

Today Bangalore is a fast-developing IT hub with entrepreneurial spirit being spread all over the region. Number of startups growing on daily basis, Bangalore has various research centers of MNCs which are headquartered in Silicon Valley. Region also attracts a lot of venture capital firms. In 2015 number of VC investment grew as well as the number of closed deals, meaning that Bangalore is attracting more VC into the region (see figure 13).

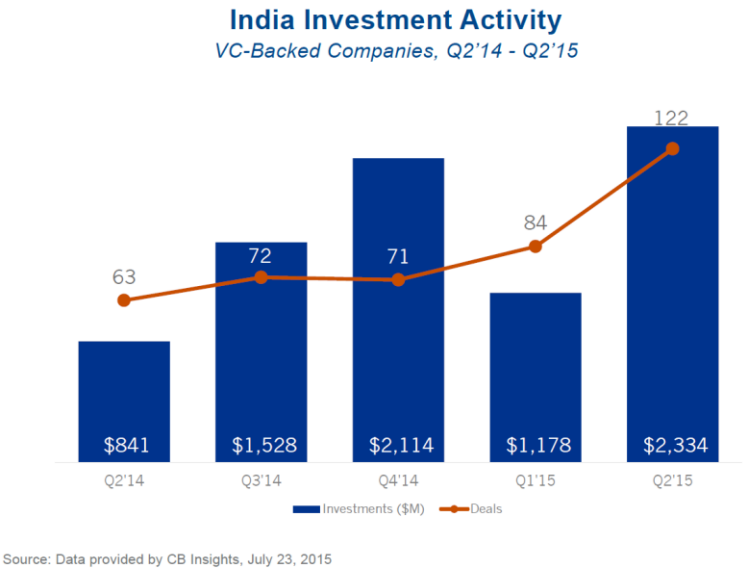


Figure 13 India Investment Activity. (adopted from Research briefs 2015)

Given the fact that Silicon Valley has India as the biggest international community the bridge between Silicon Valley IT cluster and Bangalore IT hub can be drawn through it. Additionally, as it was explained before, international workers are allowed to travel between United States and their home countries, therefore by seeking opportunities in their home counties or by exchanging information between relatives or/and friends the channel has a potential to grow and expand.

Another way of bridging two clusters, is an opportunity for those who are employed by American companies to start their own ventures in their home countries by applying principles and behaviors from previous working place.

Conclusion

After all finding have been presented final conclusion needs to be drawn in order to summarize the results and answer the main research question of "what are key success factors behind the competitiveness of Silicon Valley IT cluster?"

Several factors were outlined above:

Firstly, Silicon Valley has the ecosystem with unique features such as balanced coexistence of MNCs with SMEs and startups. Giant corporations and tiny startups are located on the same piece of land yet not causing any troubles to one another. Sec-

ondly, such factors as mobility od resources and information are present on a behavioral level. In other words, it is something that wasn't existing at some point and then it died out, but rather was carefully maintained and strengthened over time. Moreover, the same information mobility is facilitating the drive of innovations not stagnating it.

Thirdly, geographical proximity of all required facilities allows SMEs to focus on actual problem solving and innovation development without risking everything due to lack of business infrastructure.

Lastly and perhaps most importantly Silicon Valley IT cluster can be seen as one living ecosystem where it is not enough to just have all cluster members such capital providers, education institutes, research centers etc. What's more important is to organize everything in a way so that each and every cluster member will be able to communicate with each other efficiently; making sure that all interconnections are being strongly tied between each other. In other words, the "secret sauce" of Silicon Valley is interconnections and efficient and fast communication between every eve minor cluster actor from giant MNC to government to companies providing support on intellectual property. Others who tried to imitate Silicon Valley in their countries might've achieved in copying major aspects yet the reason they didn't succeeded was the lack of knowledge in how to communicate efficiently.

5 Discussion

5.1 Objectives and research questions

This study concentrated on the theoretical side of the research which primary aim was to explore the flip side of Silicon Valley IT cluster. To understand the features that make it prosperous economically, and to recognize the factors behind its extreme competitiveness.

Out of those major objectives a major research question was formulated as "what are the key success factors behind the competitiveness of Silicon Valley IT cluster." However, before the main research question could be answered it was required to break it down to minor pieces and to explore what affects the competitiveness of

this particular region. To do that a general information about the region was required. Therefore, support questions included: what is a cluster and what are its members. Additionally, the concept of competitiveness had to be defined including what are general factors affecting competitiveness of a cluster, how cluster can increase its competitiveness. In addition, several models describing competitiveness and its elements were presented.

Lastly, one of the models describing competitiveness was chosen to serve as theoretical framework or a base to form the research. Gap model fitted the study the best since it included all the required features as well as allowed to segment the problem around which the research question was formulated. The problem was identified as gaps in communication between cluster members. With this, the actual problem was found and the research context started to emerge.

It turned out that the objective that would allow answering major research question was to bring out factors that would “bridge” those “gaps” and create interconnections between cluster members. In order to find out information about the above-mentioned factors, the theoretical model was used as a frame to distinguish cluster members and to focus on centralizing one specific type of companies.

Throughout this study various types of companies were presented such as multinational corporations (MNCs), small-medium enterprises (SMEs) and startups. This research was focusing on SMEs and therefore, centralizing them inside the GAP model. From there the study was divided into 7 sub-groups coupled with general factors distinguishing Silicon Valley IT cluster as ecosystem.

5.2 Summary of findings

The study has shown that factors affecting competitiveness of Silicon Valley are as follows:

- Ecosystem with balanced coexistence of companies of diverse sizes and economies of scale. In spite of the region being known for the presence of giant corporations such Apple, Microsoft, Hewlett-Packard, region has strong business infrastructure which allows all sorts of ventures to hit their targets and earn huge returns.

- Environment which tolerates failures. Multiple opportunities of entering and re-entering with new ideas and ability to receive same level of support regardless of the risk.
- Extreme mobility of resources and information which are present on behavioral level. It is not something that was developed and later died out but rather was carefully maintained and strengthened over time.
- Geographically proximity. All required facilities are located near-by each other allowing all sorts of companies to get maximum of the business infrastructure and thus maximize their return. Moreover, with all supporting services being located in proximity SMEs can focus on solving actual problem without worrying about obtaining resources and information.
- Interconnected cluster actors. Silicon Valley does not just have all cluster members present but making sure that communication between them organizes as effectively as possible so that each and every actor only focuses on the area of expertise without limiting itself and others.

This information can be used for multiple purposes. Firstly, data from this research can serve as a frame for other regions of the world with aggregation of companies that wish to create a cluster like environment. Presented above information allows region that wishes to develop its competitiveness regardless of the industry the region specializes on. Tips showcased in this research indicate that industry is less important when it comes to creating a successful cluster but rather making sure that all actors have access to efficient and effective means of communication and that those channels are being maintained.

Secondly, information presented in this research can be utilized for enhancing connection between specific cluster members. Since some of the regions who are trying to imitate Silicon Valley might have all cluster actors present however, their activity has not yet been developed until certain level. Moreover, data of this research can be used for strengthening channels between actors such as companies, education institutes in order to prepare the region for potential generation of a cluster.

5.3 Assessment of results in the light of literature

Similarly, to the findings in the present study prior studies have discovered that factors affecting competitiveness of Silicon Valley are mobility of resources such as workforce. According to Kushida (2015, 8) mobility of employees in Silicon Valley is higher than in any other parts of California or the whole country. Multinational corporation experience struggle in retaining top-class employees, while startups and SMEs are able to grab any talent by simply moving around. On the other hand, once they grow, they face similar struggle of keeping those at one spot. As a consequence of such mobility wages have risen and therefore it is often the case that even top managers of companies can go on their own to start their own venture or simply move to another place.

The finding of toleration of failures and as a result even greater pursuit for entrepreneurs start their own companies and commercialize innovations is in line with prior studies. According to Engel (2015, 38), there are various ways to re-enter the startup ecosystem, what's more aspiration of huge returns attracts entrepreneurs from all around the world and makes them carry on with their innovation regardless of limitation in resources.

In addition, similarly to findings in present study prior studies discovered that when it comes to connection between SMES and global markets Silicon Valley allows companies to access the market through multinational corporations as well as with employees being able to travel between United States and their home countries. Engel (2015, 45) states that such phenomena when employees of SMEs are seeking opportunities or information in their home countries is called "brain circulation". Meaning that by travelling between Silicon Valley and their home countries employees will strengthen the ties through their relatives and friends. As a result, such long-term connections may lead to common projects or business operations.

5.4 Limitations of the research

Speaking of limitations of this research those can be addressed form various angles. Firstly, due to the fact that research about American region was done in Europe there was a struggle to access some of the information as a result some of the parts of the research might not have an in-depth analysis with all the factors listed. It also has to be mentioned that because only secondary data was used in this research one

possible limitation might be that research doesn't have an insight of an insider. On the other hand, a lot of secondary sources that were used were written by those who either are the alumni but have connections with Silicon Valley or they are running their activities directly from there.

When it comes to internal validity, this research's limitation is a need to rephrase the information presented in the literatures. When a concept of a valid point is raised in a source, in order to use it some words have to be replaced with synonyms without losing the actual meaning of the sentence. Therefore, the limitation here might be the words that had to be replaced. Although they would possess same meaning, their usage in this context might appear slightly inappropriate. Therefore, although the research question was answered for the factors that bridge gaps between cluster players were listed; the rigorousness of applying the methodology could have been increased.

Speaking of external validity, this research was focusing on exploring factors behind competitiveness of Silicon Valley IT cluster. However, since this research was using GAP model in order to figure out factors affecting strong bridges between cluster players, thus those findings can be generalized in the context of cluster formation and development of efficient and effective means of communication. On the other hand, those findings were based on the example of Silicon Valley which already has efficient means of inside collaboration; therefore, findings of this research are more likely to be generalized in the context of strengthening network between players inside geographic region.

Speaking of reliability, it has to be said that although the attempt was made to use most recent sources and support it with most recent figures, however, in order to provide the detailed analysis some figures from past years were used. Therefore, it cannot be said with 100% that information showcased in figures maintains and grows during future years.

As for objectivity, although there was an engagement with the topic which would allow a room for being subjective since the area is broad and the case is well known, however, this analysis was supported with valid figures which in turn; had accurate

numbers and forecasts. Therefore, it can be said that analysis might not be 100% objective yet it provided sufficient numerical support to be as objective as possible.

5.5 Recommendations for future research

It would be important to study relations of other type of firms present in the cluster from several other viewpoints in addition to the focus of the present study. For example, the relation between startups and other cluster members to see how they are bridging their gaps with other players as they are the smallest units inside the cluster as well as they are not stable in a sense that innovation might not succeed. Therefore, further research in this field would be of great help to see how startups can utilize the factors presented in this research to grow themselves and develop themselves.

In addition, it would be important to study case of not as successful cluster as Silicon Valley from viewpoints of GAP model in addition to the focus of the present study. For example, take the case of Bangalore IT hub. Since as a region it is just developing to expand internationally, it would be interesting to see how can tips presented in the findings of this research be of any help in the expansion of this IT hub in to Asian Silicon Valley.

Moreover, it has to be admited that with the collection of primary data from people who are more aware about the subject on practical level, will bring even richer results both in terms of insight as well as in terms of critical analysis.

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